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A2LA Accredited ISO/IEC 17025:2005 Certificate # 2558.01

396 High Speed Bright Mid-Phosphorus Electroless Nickel Plating System

The 396 System is specifically formulated to produce an extremely bright nickel-phosphorus deposit at a consistent high rate of deposition. The 396 System is recommended for applications requiring a highly decorative finish and moderate corrosion resistance. The 396 System is replenished at a 2:1 ratio with Liquid Nickel Sulfate (LNS) for economy of operation.

The 396 System offers the following characteristics:

- Exceptional Stability
- High Rate of Deposition
- Consistent Deposit Brightness
- High Tolerance to Contaminants
- Low Operating Cost

TYPICAL DEPOSIT PROPERTIES:

Phosphorus Content	7%-9% Typical Weight Percentage
Melting Range	1620-1760° F
Density	8.1 Grams per Cubic Centimeter
Hardness	550 HK_{100} as plated
Magnetic Properties	Slightly Magnetic
Nitric Acid Test	Fails
Hydrochloric Acid Test	Passes
Neutral Salt Spray	Up to 100 hours to first corrosion

BATH OPERATING DATA:

Solution Make-up Materials Required:

- 396-M (Make-up Only) 15% by volume
- Liquid Nickel Sulfate (Electroless Nickel Grade) 4.5% by volume
- DI water to operating volume
- 50% Ammonium Hydroxide Solution to raise pH to recommended range

Accu-Labs 396 Make-up Procedure:

- Add DI water to properly cleaned and passivated tank (fill to half volume)
- Add required amount of 396-M
- Add required amount of Liquid Nickel Sulfate
- Fill tank to working volume with DI water
- Mix thoroughly with solution and slight air agitation
- Heat to 190° F
- Analyze nickel content and adjust to 6.0 g/l
- Check pH and adjust to 4.70-5.10

Recommended Operating Parameters:

Component	Range	Optimum
Nickel Metal	5.10-6.30 g/l	6.0 g/l
Hypophosphite	27.0-33.0	30.0 g/l
pH	4.70-5.10	4.90
Temperature	180-200° F	190° F
Bath Loading Sq Ft/Gal	0.10-1.00	0.50

Note: pH can be adjusted upward with a 50% solution of ammonium hydroxide for steel substrates; potassium carbonate solution should be used for aluminum. If pH needs to be adjusted downward a solution of 10% sulfuric acid can be used.

Typical Bath Performance:

- Plating Rate-Typically 1.0 mils/hour with all parameters at optimum (new bath)
- Solution Life (Metal Turnovers)
    - Steel 6-10
    - Aluminum
        - Ammonium Hydroxide pH adjust 5-7
        - Potassium Carbonate pH adjust 7-9
        - With Alkaline Strike prior to plate 6-10
        - Individual applications and practices will affect bath life

Bath Maintenance:

To ensure proper operation of the 396 system, the solution chemistry should be maintained using the aforementioned operating parameters. This is accomplished by measuring and monitoring the nickel metal concentration. Upon determination of the nickel metal concentration, additions of both Liquid Nickel Sulfate and 396-R are made based on the following replenishment guide for a 100-gallon bath:

Nickel %	Nickel Concentration	Additions LNS	Additions 396-R
100	6.0 grams per liter	None	None
95	5.7 grams per liter	835 mls	1670 mls
90	5.4 grams per liter	1670 mls	3340 mls
85	5.1 grams per liter	2.5 liters	5.0 liters
80	4.8 grams per liter	3.3 liters	6.6 liters
75	4.5 grams per liter	4.1 liters	8.2 liters

NICKEL METAL DETERMINATION:

Reagents:

- 0.0575M EDTA
- 50% Ammonium Hydroxide
- Murexide Indicator

Procedure:

- Add 10 ml bath sample to 100 ml DI water
- Add 10 ml ammonium hydroxide solution
- Add 0.2 grams murexide indicator
- Titrate with EDTA from pale yellow to purple (violet) end point
- Record number of mls of EDTA titrated

Calculation:

- Mls of 0.0575 EDTA x 0.339 = grams/liter nickel or
- Mls of 0.0575 EDTA x 5.65 = % nickel in bath

Handling Considerations:

When handling Accu-Labs 396 components proper precautions should be observed. Do not take internally and avoid contact to skin and eyes. Wear clean chemical resistant gear, goggles, gloves, apron, footwear, and face shield. Accu-Labs recommends reading the MSDS prior to use.